

What is claimed:

1. A sensing assembly for sensing a level of liquid in a reservoir, said sensing assembly comprising:

a first input port for receiving a first input voltage signal;

a second input port for receiving a second input voltage signal;

an excitation circuit electrically connected to said first and second input ports for receiving the first and second input voltage signals and for generating a first excitation signal and a second excitation signal; and

a receiving circuit disposed adjacent said excitation circuit defining a variable capacitance with said excitation circuit, said receiving circuit producing an output voltage signal variable with the level of liquid in the reservoir due to capacitance changes between said excitation circuit and said receiving circuit due to dielectric changes created by the liquid.

2. A sensing assembly as set forth in claim 1 wherein said receiving circuit includes first and second receiving electrodes extending along a portion of the reservoir.

3. A sensing assembly as set forth in claim 2 wherein said first receiving electrode extends along a first non-linear path.

4. A sensing assembly as set forth in claim 3 wherein said second receiving electrode extends along a second non-linear path differing from said first non-linear path.

5. A sensing assembly as set forth in claim 4 wherein said first non-linear path extends along a sine wave shape.

6. A sensing assembly as set forth in claim 5 wherein said second non-linear path extends along a cosine wave shape.

7. A sensing assembly as set forth in claim 6 wherein said excitation circuit includes first and second excitation electrodes extending along a portion of the reservoir, said first and second excitation electrodes disposed adjacent to and separated by said first receiving electrode.

8. A sensing assembly as set forth in claim 7 wherein said excitation circuit includes third and fourth excitation electrodes extending along a portion of the reservoir, said third and fourth excitation electrodes disposed adjacent to and separated by said second receiving electrode.

9. A sensing assembly as set forth in claim 8 including a first trace extending between said first receiving electrode and said first and second excitation electrodes, said first trace connected to ground.

10. A sensing assembly as set forth in claim 9 including a second trace extending between said second receiving electrode and said third and fourth excitation electrodes, said second trace connected to ground.

11. A sensing assembly for sensing a level of liquid in a reservoir, said sensing assembly comprising:

a first input port for receiving a first input voltage signal;

a second input port for receiving a second input voltage signal;

an excitation circuit electrically connected to said first and second input ports for receiving the first and second input voltage signals and for generating a first excitation signal and a second excitation signal; and

a receiving circuit having first and second receiving electrodes, each disposed adjacent a portion of said excitation circuit, said first receiving electrode extending through a sine wave form and said second receiving electrode extending through a cosine wave form such said receiving circuit produces an output voltage signal variable with the level of the liquid in the reservoir due to capacitance changes between said excitation circuit and said first and second receiving electrodes due to dielectric changes created by the liquid.

12. A sensing assembly as set forth in claim 11 including a switch for selectively reading said output voltage signal from each of said first and second receiving electrodes.

13. A sensing assembly as set forth in claim 12 wherein said excitation circuit includes first and second excitation electrodes extending along a portion of the reservoir, said first and second excitation electrodes disposed adjacent to and separated by said first receiving electrode.

14. A sensing assembly as set forth in claim 13 wherein said excitation circuit includes third and fourth excitation electrodes extending along a portion of the reservoir, said third and fourth excitation electrodes disposed adjacent to and separated by said second receiving electrode.

15. A sensing assembly as set forth in claim 14 including an amplifier for receiving each of said first and second excitation signals and for producing an imbalance current.

16. A method for measuring a level of a liquid in a reservoir using a sensing assembly having first and second receiving electrodes and an excitation circuit having first, second, third and fourth excitation electrodes, all of the electrodes extending through a portion of the reservoir, the method comprising the steps of:

applying a first input voltage signal to the first and third excitation electrodes having a predetermined amplitude and a defined phase;

applying a second input voltage signal to the second and fourth excitation electrodes having the predetermined amplitude and 180 degrees out of phase with the defined phase of the first input signal;

measuring a first capacitance generated between the first excitation electrode and first receiving electrode to create a first measurement;

measuring a second capacitance generated between the second excitation electrode and first receiving electrode to create a second measurement;

measuring a third capacitance generated between the third excitation electrode and the second receiving electrode to create a third measurement;

measuring a fourth capacitance generated between the fourth excitation electrode and the second receiving electrode to create a fourth measurement; and

calculating the level of the liquid in the reservoir based on the values of the first, second, third and fourth measurements.

17. A method as set forth in claim 16 wherein the step of calculating the level of the liquid includes calculating the difference between the first and second measurements to create a first difference value.

18. A method as set forth in claim 17 wherein the step of calculating the level of the liquid includes the step of calculating the difference between the third and fourth measurements to create a second difference value.

19. A method as set forth in claim 18 including the step of associating a zero degree value for a bottom surface of the reservoir.

20. A method as set forth in claim 19 including the step of associating a 360 degree value for the top surface of the reservoir.

21. A method as set forth in claim 20 including the step of using the first and second difference values in the equations

$$\cos(z) = \frac{(S2^2 - S1^2)}{(S1^2 + S2^2)} \quad \text{and} \quad \sin(z) = \frac{2(S1 * S2)}{(S1^2 + S2^2)}$$

wherein z is the level of liquid in the reservoir, S1 is the first difference and S2 is the second difference.